

FREIBERG (A.H.)

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BY

ALBERT H. FREIBERG, M.D.,  
OF CINCINNATI, OHIO.



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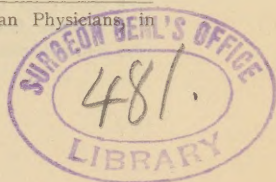


## ***THE TREATMENT OF CLUB-FOOT.<sup>1</sup>***

BY ALBERT H. FREIBERG, M.D.,  
OF CINCINNATI, OHIO.

THE methods employed in the treatment of club-foot are almost as numerous as those who treat it. It is the more comprehensible on this account that all methods at present employed are really modifications and combinations of others gone before. Plaster-of-Paris, soluble glass, splints, orthopedic appliances of more or less complicated character, surgical procedures involving operations, subcutaneous or open—these have all been used and are being used in various combinations, and there can be no doubt that club-foot can be often successfully treated by almost any of them. As young men, however, there will come to some of us, at least, a time when we shall have to select a method from the immense number with which to treat a given case, and it is with this in view that I present this paper. I have had the opportunity in the past few months of seeing quite a large number of cases in the clinic of Professor Wolff—cases freshly treated, which had presented themselves during the treatment and after its discontinuance—and I desire to convey to you the impressions that these cases made upon me.

<sup>1</sup> Read before the Association of American Physicians, in Berlin, June 30, 1892.





It might be well to cast a glance at the principles on which the treatment is founded. Every case of *true* club-foot is dependent upon abnormal shape of the foot skeleton, and this is as true of the congenital as of the acquired forms; the changes of the soft parts are of secondary nature. The changes found in the bones of the foot never involve one bone alone; all are involved to a greater or less degree, and especially is this true of the tarsal bones.<sup>1</sup> Julius Wolff has shown<sup>2</sup> that the shape of every bone, as well as its internal architecture, are the expressions of the static demands made upon it; further, that the internal architecture and external form always correspond with one another. He has also shown that we are no longer to consider the bones as mere levers, of an inert material, but as living tissues, and as capable of accommodating themselves to different changes as are our other tissues. Where weight is to be borne, where strain is to be sustained, bone-tissue is laid down; and on the other hand, where bone-tissue is no longer needed because of changed statical conditions, it disappears. Thus it is, as Wolff has pointed out,<sup>3</sup> that the hump left on the dorsum pedis by the correction of a club-foot disappears spontaneously, without making pressure upon it with the dressing.

As in so many other conditions, one principal task is to merely modify the direction of constantly acting forces and maintain them so for a sufficient period

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<sup>1</sup> Hoffa: Lehrb. der Orthop. Klin., 1891.

<sup>2</sup> Gesetz der Transform. der Knochen. Berlin, 1892.

<sup>3</sup> "Ueber d. Ursachen u. d. Behandl. d. Deformitäten, insbes. der Klumpfusses, Berl. klin. Wochenschr., 1885, No. 12.

of time; Nature will do the rest. We are not to be satisfied with making a foot appear normal; if the bones have not changed their shape, if they do not stand in proper relation to the extremity whose weight they are bearing, our treatment will be in vain, for the patient will have a recurrence of his deformity soon after discarding our appliance. On the other hand, if our treatment has been successful, if we have the bones of the foot changed to such a form as is normal for their function, there can be no recurrence; for in those lines in which pressure or tension occurs, Nature has laid down bone-trabeculae of sufficient strength, and she has given the bone a corresponding outward form.

It is not so simple a process, this change in the form of the bones, as Volkmann's theory would make it; atrophy from pressure, and growth in the direction of least resistance do not explain it; rather the opposite is true.<sup>1</sup> When a club-foot recurs after treatment, we may assume that it was not entirely cured, for were it so the use of the limb would tend toward making its new form permanent instead of the contrary. I must except from this last statement the paralytic club-foot; the prognosis here depends entirely upon the paralysis, or the measures taken to counteract it.

Our indications for treatment, then, are really two. First, we must bring the foot into proper relation with the rest of the extremity and the body; and secondly, we must retain it there in *functional activity* for a sufficiently long time to enable the bones to undergo the necessary metamorphosis as a

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<sup>1</sup> Wolff, quoted by Hoffa, loc. cit., p. 20 et seq.

result of their function. From these indications I think it will be apparent that any form of appliance, to answer our purpose, must be of a more or less permanent character. All shoes and splints which are to be taken off at times, such as during sleep, fall short of our demands. We wish the weight of the body, which is our curative force, to work constantly and always in the same lines. The requirements which we make are met by no other material as well as by the plaster dressing if properly applied, and to properly apply it for the treatment of club-foot means merely the mastery of certain details which should be not at all difficult for any physician capable of properly dressing a fracture. Plaster-of-Paris in the treatment of club-foot is by no means new, but it is the development of minute details in its application, and proper attention to all of them, which make it a method, and the success that follows is in proportion to the care and skill used in treatment, rather than to the degree of deformity. A plaster dressing may sometimes be properly applied in one or two sittings; not infrequently four or five are required, and occasionally several more. The method, therefore, calls for the greatest patience on the part of physician and patient; but few physicians will begrudge this when once they have used it properly, and still fewer patients with the more severe forms of club-foot will spend much time in choosing between a plaster treatment, that is perhaps tedious for a while, and one of the bloody operations.

The question of tenotomy must in each case be decided for itself. Quite a number of cases of club-



foot can be treated without any operation upon the soft parts; these are usually the slight deformities in very young children. In those cases, usually of more marked deformity, in which the tendo Achillis and the aponeurosis plantaris seem to offer any considerable resistance to the correction, one or both should be incised subcutaneously in the usual manner. Rarely does it become necessary to divide any of the other tendons of the foot, the tibialis posticus, or the flexors. The tenotomy having been made, it is advisable to apply aseptic dressings to the wounds and postpone the application of the plaster for two or three days.

We now come to the most important part of our subject—the technique of the plaster dressing for club-foot. Speaking in general terms there are two methods of treatment by plaster dressing, and these are radically opposed to one another. König's method<sup>1</sup> consists essentially of two steps: the redressement and the application of the plaster. The forcible redressement is the leading idea of the method, as König describes it, and it is his intention from the start to tear ligaments, to bend or even break bones. He himself says that the difficulties do not lie in the degree of deformity, but rather in the physical state of the bones and the firmness of the ligaments.

The redressement is made as follows: The patient, having been anesthetized, is placed on his side and an assistant fixes the knee firmly. The operator then places the most prominent convex portion of the foot (usually the region of the cal-

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<sup>1</sup> König: *Lehrb. der spec. Chirurgie*, Bd. iii, Berlin, 1889.

caneo-cuboidal joint) upon a suitably protected wooden fulcrum and seeks, with one hand grasping the heel and the other holding the anterior part of the foot, to use the weight of his body in forcibly correcting the deformity. According to König, in order that the procedure shall be of avail a crackling sound should be heard. The external convexity of the tarsus having been thus reduced, the foot is forcibly brought into dorsal flexion and abduction. König advises against doing too much in one sitting, and says that the entire correction usually occupies two or three operations. After each sitting a plaster dressing, with a cotton substratum, is applied ; this dressing is to accomplish nothing further than holding the ground obtained by the forcible redressement. "Elevation and all other precautions against considerable swelling should not be neglected." The sittings are repeated at intervals of two or three weeks. In many cases, principally in adults, the force required is too great for the hand, and various instruments have been devised for making the correction. König recommends Bradford's instrument.

The method of Wolff differs from this radically ; instead of purposely using sufficient force to tear ligaments and crush bones, instead of completing the redressement in a small number of sittings, just the opposite is done. The force used should never be sufficient to causing gross solutions of continuity in the tissues, and the number of sittings should be sufficiently great to accomplish this. What Wolff attempts to produce by his redressement is subluxations of the tarsal bones ; the form of the bones is not to



be changed by the operation itself; this is essential. The bones are to be changed by the change of function, by being placed in different relations with one another and with the extremity. The following is the method of applying the dressing as it is done at Wolff's clinic:

Excepting for very slight degrees of club-foot and in very young children, anesthesia is necessary. The patient, anesthetized, is placed on his back upon the table, and, with a blue pencil, the middle of the patella is marked. An assistant fixes the knee in such a way as not to hide the patella. The operator now seizes the anterior part of the foot with one hand and, placing his other hand upon the heel, seeks to correct the deformity by first twisting the foot outward as far as possible, pronating it, then making dorsal flexion, and finally abducting the front part of the foot by bringing the heel toward the median line of the body.

Having thus secured the foot in its proper position, or at least as nearly so as can be done in this one sitting without the use of too much force, the hands of the operator are carefully replaced by those of another assistant, holding the ground gained as nearly as possible. The operator then takes strips of rubber adhesive plaster, about one inch wide, and uses them to hold the foot in position. The first strip begins on the upper surface of the foot close to its inner edge and posterior to the ball of the great toe; it is then carried across the sole, up the outer side of the foot and a short distance up the leg without making much of a spiral around it. The second strip is placed anterior

to this in like manner ; the third strip begins at the ball of the great toe, and a fourth strip runs along the base of the toes. A greater or less number of strips than this may be required, according to the size of the foot and the resistance offered by it.

The two assistants now raise the limb from the table, the one still firmly fixing the knee, the other holding the foot by the toes, and the operator pads the foot and leg as evenly as possible with cotton up to the tibial tuberosity. With plaster bandages that are not too wide, a smooth dressing is applied, encasing the foot and leg ; the tips of the toes are left uncovered, excepting the great toe ; this is almost entirely covered in. The greatest care must be taken not to make the dressing too tight, and to make it as light as is compatible with strength.

As soon as the bandage has been applied the operator seeks to correct the deformity as much as possible ; the assistant with one hand pushes the heel toward the middle line, and with his other hand presses the outer edge of the foot upward. The foot is thus held in position until the plaster is quite firmly set. If the foot is in proper position, a sagittal plane passing from the anterior superior iliac spine through the mark in the patella and through the center of the ankle-joint must strike several centimeters inside of the tip of the great toe.

Two fenestra are now cut in the bandage as a matter of routine. Experience has shown that with a dressing thus applied two points are especially liable to decubitus: one point is the external surface of the ankle-joint, the other the internal surface of the great toe, and especially at the metatarso-

phalangeal articulation. The external side of the ankle-joint, before a convex surface, has been converted by the redressement into a sharp angle, and there is now here a superfluous amount of skin; into this angle a spur of plaster bandage projects. Over this an elliptical fenestrum is made, and this is also done at the inner side of the great toe, but the end of the toe should always be left covered, as this is one of the strong places in the dressing. That the dressing shall be considered satisfactory requires that the toes lie perfectly naturally beside one another and that the middle phalanges of the outer four toes be uncovered; to accomplish this is by no means the simplest task of the treatment and it not seldom requires considerable cutting and patching before entire satisfaction is obtained. However, too much time can scarcely be spent upon this part of the dressing, as it cannot possibly be comfortable to the patient unless the toes lie properly. Further alterations at the toes can usually be undertaken on those days on which no redressement is made.

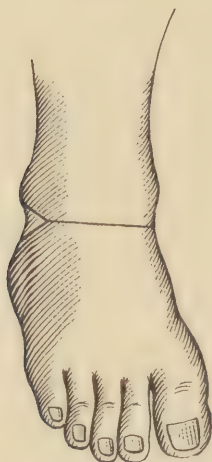
Some pain is usually complained of after awakening from the narcosis and the patient often fails to sleep the first night, but unless the redressement has been carried too far in this one sitting the pain is not excessive. If pain is still present on the next day a fenestrum may be cut out at the painful spot. Otherwise the dressing is left undisturbed until the next sitting.

The graduated redressement, the correction of the deformity in several sittings, without causing anatomic lesions other than altering the relations of



parts to one another, is the characteristic of Wolff's method ; when this is accomplished, by making repeated alterations in the same plaster dressing in the way to be described, it constitutes the so-called "Ettappenverband." The second sitting may, then, occur in several days, usually on the second

FIG. 1.



or third, sometimes not until the fourth. It is proceeded with as follows : With a large sharp knife a large, wedge-shaped piece is cut from the dressing on the outer side of the ankle-joint, and the ends of this continued in a line around the joint. (Fig. 1.) This is cut through to the cotton padding and the dressing is now in two separate pieces, and while the wedge-shaped defect in the plaster allows the

further correction, the foot cannot slip back into its old position ; great care must be taken not to make the linear cut too near the heel, lest the foot be able to slip in the dressing and thus defeat our object and make a completely new dressing necessary. An assistant grasps the upper section of the dressing, drawing it away from the lower, at the same time being careful not to allow a rotation of the leg in the dressing ; the operator then corrects the deformity still more by moving the foot encased in the lower piece and the dressing is fixed in its new position by an additional plaster bandage. Care must be taken lest a fold of skin be caught between the two pieces of the dressing when brought together. If a very large correction is still to be made anesthetics may be necessary ; most often they are not.

In this way the same dressing is altered a sufficient number of times until the patient stands in his dressing with the foot in satisfactory position, and satisfactory position means that the foot shall be slightly pronated, that it shall be dorsally flexed, abducted, that the toes shall lie normally beside one another, and that the patient shall be free from pain. It is a fundamental rule of the treatment that whenever pain is complained of a window shall be cut out at the painful spot. In infants this has often its difficulties, of course, but the bandage should rather be removed entirely than the risk of decubitus be run. When the position of the foot is satisfactory we are ready to put the finishing touches on the dressing : First, all fenestra are covered over with plaster bandage. When this is hard the plaster dressing is pared off wherever thicker than necessary and is

made as seemly as possible. Strips of pine shaving are now glued on to the dressing in order to strengthen it, and these strips are held by crinoline bandage painted over with carpenter's glue. When the glue is hardened, a very light soluble-glass bandage covers the dressing. The patient now has shoes made to fit over the dressings and starts to walk immediately. By working at the feet alternately the most severe cases of double-sided club-foot can be corrected and the patients be walking in the dressings within four weeks at most, and in cases easy of treatment within one week.

The patients are now instructed to work as much as is agreeable to them, but are kept under occasional supervision, lest the dressing weaken or the foot change its position. In this case it is best to make a new bandage, as only one sitting will be required, and an opportunity is given to measure the degree of progress accurately. This does not, however, usually occur. With the exception of very severe and intractable cases, when no mishap occurs to the dressing, the patients are cured when it is taken off. The length of time during which the dressing must be worn varies exceedingly, of course—from a few weeks to a year, according to the age of the patient rather than to the degree of deformity. When the dressing is finally taken off, a course of massage, bathing in hot water, and passive movements, is indicated.

What shall be considered a satisfactory result in the treatment of club-foot? If after the patient has had the benefit of massage, passive movement, and after he has become accustomed to walking without



the dressing, if he walks with the sole fully touching the ground, as it normally should, if he is able to dorsally flex the foot and is able to pronate to some extent, he may be pronounced cured, and he will not have a recurrence. If the patient is unable to fulfil these requirements, or any one of them, there is always the possibility of recurrence, because there has never been a cure and the treatment should be continued accordingly.

This is Wolff's method, and in his clinic all cases of club-foot are treated in this way. The congenital club-foot of infants but a few weeks old, as well as that of adults, is treated thus and with results remarkably satisfactory. That forcible redressement, in the sense that König uses it; that the various operations, such as Phelps's, the wedge excisions, enucleations of the talus or other bones are necessary for the cure of even extreme cases of club-foot is boldly denied by Wolff, and in proof he offers a series of cases which upon careful examination will convince the most skeptical. The difference in the two methods of treatment by plaster is nowhere better demonstrated than by the fact that whereas König advises the sittings to be repeated at intervals of two or three weeks, Wolff repeats them at intervals of as many days; that while König feels bound to advise elevation of the limb and other precautions against swelling, Wolff's patients are able to stand in the dressing the day after its application.

The case<sup>1</sup> which Professor Wolff has kindly per-

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<sup>1</sup> Case of "Gerstmann" Langenbeck's Archiv, Bd. xxxiii, Heft I.

mitted me to show you this evening demonstrates admirably the possibilities of the method and the permanency of the result. The patient, now twenty-eight years of age, was treated eight years ago, and the plaster cast which I present will convince you that his deformity was of the severest type. Although this method of treating club-foot was not yet fully developed, and although the deformity was corrected more rapidly and with more violence than was necessary, I think there is no doubt in your minds that the result is ideal. This patient was twenty years of age when the treatment was instituted, and Wolff has demonstrated in his communications on the subject that a very much greater age by no means places the result in jeopardy.<sup>2</sup> Lastly, in order to inform you more accurately how a case is handled, I shall mention the notes in the case of a boy, nine years of age, of whose right leg and foot I present a cast. (Fig. 2.) The condition was congenital and almost the same in both feet.

*May 24.* The tendo Achillis and the plantar fascia of both feet were incised subcutaneously.

*27th.* Plaster dressing on right foot.

*31st.* Plaster dressing on left foot.

*June 4.* Redressement of right foot.

One week's suspension of treatment because of the Surgical Congress.

*14th.* Redressement of left foot.

*15th.* Redressement of right side.

*17th.* Redressement of left side.

*21st.* Redressement of left side.

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<sup>2</sup> *E.g.*, cases described in Berl. klin. Wochenschr., 1889, No 8.

FIG. 2.



*26th.* Discharged from the clinic, after shoes had been made and had been worn for a day and found perfectly comfortable. The treatment embraced really three weeks, and might have been done in less time. On the days intervening between those mentioned some improvement was usually made, straightening the toes, making or closing a fenestrum. The patient left the clinic able to walk with great ease, and I will ask you to believe me when I say that the feet were in as splendid position as could be desired. I am, unfortunately, not able to show the patient himself, but from what I have seen I feel confident that in six months he will be entirely relieved of his deformity.<sup>1</sup> Such feet as these are certainly of the most severe form.

The most difficult cases to treat by this method seem really to be cases in infants with very short, fat feet; difficult because they must be handled with great tenderness and because it often requires the greatest patience until a dressing is secured which holds the foot in the desired position. Whether the club-feet of very young infants should be treated with plaster dressing I regard as still an open question, in view of the difficulty of applying an efficient dressing and in recognition of the great good often to be accomplished by passive movements alone. If the latter have been unsuccessfully tried the case is still amenable to the treatment by plaster dressing.

It occasionally happens that some time after the dressings have been left off, the foot again shows a tendency toward supination. When this occurs,

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<sup>1</sup> The patient reported at the clinic several days ago, and is walking without any pain or inconvenience whatever.



we are to blame ; the dressings have been removed too soon, but an easy remedy is the application of another dressing for a time ; as already remarked, if the club-foot has been *cured* it will not recur.

That no anatomic lesions of consequence occur during the treatment by this method is evidenced by the fact that the patients can all bear their weight upon the extremity the day after application of the dressing ; had bones been fractured, had ligaments been torn, they would scarcely be in a position to do this. The dressing does not incommode in the beginning more than would a new shoe ; afterward the patients grow perfectly accustomed to it.

In conclusion, I desire to express my deep sense of obligation to Professor Wolff for his very kind assistance in my study of the subject, and for the use of his clinical material.

BERLIN, JULY 12, 1892.





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